



Opening the Way to a Hydrogen Society

The world's first demonstration projects for hydrogen supply chains aims at the wider use of carbon-free, next-generation energy

Given the urgent desirability of climate action—one of the Sustainable Development Goals (SDGs)—hydrogen is increasingly seen as part of a green energy that does not emit CO₂ when used for energy. Beyond being green, hydrogen can be produced from many different resources, and strengthens energy security by making it possible to diversify procurement risk.

Japan has long taken hydrogen seriously as an energy source and already leads the world in fuel cell vehicle technology. Now it is working to promote the global utilization of hydrogen, such as by hosting the Hydrogen Energy Ministerial meeting in October 2018, in which 21 countries, regions and organizations participated.

To realize a hydrogen energy infrastructure, costs must be lowered. With the goal of building a global supply chain that can produce and convey large quantities of hydrogen, procured from inexpensive resources anywhere in the world, two demonstration projects, subsidized by New Energy and Industrial Technology Development Organization (NEDO), are scheduled to launch in 2020.

One project involves transporting hydrogen from Brunei Darussalam to Japan. Hydrogen produced from surplus natural gas will be liquefied by chemical reaction, transported



CG image of the hydrogen production and hydrogenation plants in Brunei Darussalam at which hydrogen will be created by the project led by AHEAD*. Construction has been underway since April 2018, and operations are scheduled to begin in 2020.

by ship at ambient temperature and pressure to Japan, and extracted at a plant in Kawasaki City using technology developed by Chiyoda Corporation, so it can be used in thermal power generation.

According to Hideki Endo, president of the Advanced Hydrogen Energy Chain Association for Technology Development (AHEAD*), which is organizing the demonstration project, “Liquefying hydrogen by chemical reaction reduces its volume by a factor of 500, which allows large quantities to be transported efficiently. Because this can be done at ambient temperature and pressure, the existing infrastructure

can be used.”

The other project is being organized by the CO₂-free Hydrogen Energy Supply-Chain Technology Research Association (HySTRA**), which aims to utilize brown coal from Australia. Brown coal—the sleeping giant of global energy resources—contains so much moisture and spontaneous

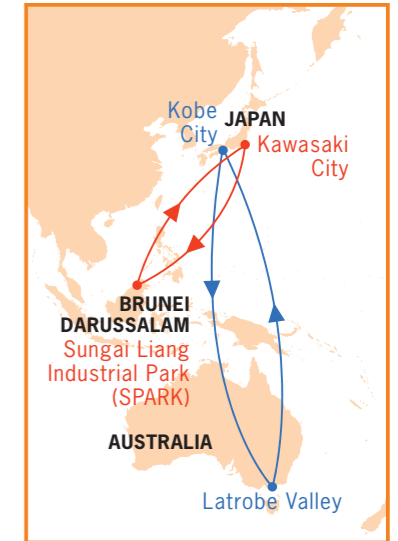


Hideki Endo, the president of AHEAD, says that by 2040, renewable energy will be the main source of CO₂-free hydrogen.

*AHEAD; Chiyoda Corporation, Mitsubishi Corporation, Mitsui & Co., Ltd., Nippon Yusen Kabushiki Kaisha



The first Hydrogen Energy Ministerial Meeting, held in Tokyo, will bring together ministers of major countries committed to hydrogen-related efforts worldwide.



CG image of the world's first liquefied hydrogen carrier that will be used by the project led by HySTRA**. In the future, even these hydrogen carrying ships will run on hydrogen.



Motohiko Nishimura, chief administrative officer of HySTRA, says that successful commercialization is linked to understanding what the world will require in 2030.

ignition properties that it cannot be transported efficiently, and thus has no place in international trade, but HySTRA is working on a project to produce hydrogen from brown coal, liquefy hydrogen like LNG, and then transport it to Japan. If the project is successful, a stable supply can be expected.

**HySTRA; Kawasaki Heavy Industries, Ltd., Electric Power Development Co., Ltd., Iwatani Corporation, Shell Japan Ltd., Marubeni Corporation

“Not only do we hope to produce hydrogen from brown coal,” says Motohiko Nishimura, HySTRA’s chief administrative officer, “but also to create a supply chain that includes the efficient transportation of cryogenic liquefied hydrogen, and most-advanced cryogenic storage tanks in Kobe City.”

Both projects offer major benefits to the supplying countries, including the possibility of utilizing hitherto unused resources, and creating employment.

Before hydrogen can become a common energy source, many problems must be solved, such as assuring that it can be handled safely,

creating demand, and implementing the capture and storage of the CO₂ generated during production. But given the great expectations of hydrogen as a carbon-free source of energy, the projects to demonstrate the feasibility of constructing a global supply chain deserve close attention. ✨



A system for supplying hydrogen will not have an impact unless demand is also stimulated. In April 2018, in Port Island of Kobe City, Kawasaki Heavy Industries, Ltd. and Obayashi Corporation successfully conducted the world's first demonstration of supplying heat and electricity in the urban area using a gas turbine fueled by 100% hydrogen.